



# ICAO ENGINE nvPM EMISSIONS DATA SHEET

## SUBSONIC ENGINES

ENGINE IDENTIFICATION: CFM56-5B9/3 BYPASS RATIO (-): 5.9  
 UNIQUE ID NUMBER: 01P08CM110 PRESSURE RATIO  $\pi_{co}$  (-): 24.2  
 COMBUSTOR: Tech Insertion  
 ENGINE TYPE: TF RATED OUTPUT  $F_{co}$  (kN): 103.6

### REGULATORY DATA

CHARACTERISTIC VALUES:	$LTO_{mass}/F_{co}$ (mg/kN)	$LTO_{num}/F_{co}$ (particles/kN)	NVPM MASS CONCENTRATION ( $\mu\text{g}/\text{m}^3$ )
LTO/ $F_{co}$ AND MAX nvPM <sub>mass</sub>	68.1	9.41E+14	1216
AS % OF CAEP/10 LIMIT	-	-	18.7
AS % OF CAEP/11 LIMIT (InP)	2.8	6.3	
AS % OF CAEP/11 LIMIT (NT)	12.7	14.5	

### MEASURED DATA

MODE	POWER SETTING (% $F_{co}$ )	TIME minutes	FUEL FLOW kg/s	EMISSIONS INDICES*		NVPM MASS CONCENTRATION PEAK nvPM <sub>mass</sub> ( $\mu\text{g}/\text{m}^3$ )
				EI <sub>mass</sub> (mg/kg)	EI <sub>num</sub> (particles/kg)	
TAKE-OFF	100	0.7	0.955	42.7	4.31E+14	
CLIMB OUT	85	2.2	0.793	30.3	4.11E+14	
APPROACH	30	4.0	0.277	1.1	4.49E+13	
IDLE	7	26.0	0.095	0.9	4.61E+13	
LTO TOTAL (kg, mg, number of particles)			359	5080	7.01E+16	-
NUMBER OF ENGINES				1	1	1
NUMBER OF TESTS				3	3	3
AVERAGE LTO/ $F_{co}$ VALUES (mg/kN, particles/kN)				49.0	6.77E+14	-
MAX EI VALUES (mg/kg, particles/kg) AND MAX MASS CONC. ( $\mu\text{g}/\text{m}^3$ )				42.7	4.31E+14	945

\* Emissions Indices are corrected for thermophoretic loss and fuel hydrogen content

### DATA FOR EMISSIONS INVENTORIES (ESTIMATIONS FOR ENGINE EXIT PLANE VALUES)

MODE	POWER SETTING (% $F_{co}$ )	CORRECTED EMISSIONS INDICES	
		EI <sub>mass_SL</sub> (mg/kg)	EI <sub>num_SL</sub> (particles/kg)
TAKE-OFF	100	51.7	1.29E+15
CLIMB OUT	85	37.9	1.38E+15
APPROACH	30	1.6	2.55E+14
IDLE	7	1.4	3.00E+14

### AMBIENT CONDITIONS

	From		To	
	BAROMETER (kPa)	99.5	100.2	HEAT OF COMBUSTION (MJ/kg)
TEMPERATURE (K)	295.5	311.8	HYDROGEN CONTENT (%mass)	13.83
HUMIDITY (kg water/kg dry air)	0.0066	0.0122	AROMATICS CONTENT (%vol)	18.7
			NAPHTHALENE CONTENT (%vol)	0.67
			SULPHUR CONTENT (ppm by mass)	519

MANUFACTURER: CFM International  
 TEST ORGANIZATION: Safran Aircraft Engines  
 TEST LOCATION: Villaroche, France  
 TEST DATES: 25/07/2019-30/07/2019

### REMARKS

1. Engine 849-166/1
2. Certification Report CR-2097/3 SUPPLEMENT 2-5B, CR-2097/3 SUPPLEMENT 2-7B